GSR030

18 May 2023

Online Meeting via Teams

Welcome

GSR030

18 May 2023

Online Meeting via Teams

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Objectives and Timeline

Teri Puddefoot – National Grid ESO Code Administrator

Objectives for GSR030

Objectives of Workgroup 3

- SQSS Infeed Loss Risk Change Proposal
- Scoping for cost benefit and impact assessment

Timeline for GSR 030 – Proposed Timeline - *Workgroup*

Milestone	Date	Milestone	Date
Modification presented to Panel	09 November 2022	Workgroup Report Showstopper	07 July 2023
Workgroup Nominations (15 Working Days)	14 November 2022 to 09 December 2022	Workgroup Report – Submission to Panel	12 July 2023
Workgroup 1 Proposer's presentation, check Terms of Reference, initial review of legal text	20 January 2023	Panel sign off that Workgroup Report has met its Terms of Reference	19 July 2023
Workgroup 2 Bipole, anchor drag risk, N-1-1 criteria	07 March 2023	Code Administrator Consultation	24 July 2023 to 24 August 2023
Workgroup 3 Scoping for cost benefit and impact assessment	18 May 2023	DFMR Submission to Panel	05 September 2023
Workgroup 4 Refine solution(s) and materials to be provided with Workgroup Consultation	19 April 2023	DFMR Panel Vote	13 September 2023
Workgroup 5 Finalise Workgroup Consultation document	09 May 2023	FMR to Ofgem	25 September 2023
Workgroup Consultation	15 May 2023 to 05 June 2023	Ofgem decision	25 September 2023 to 27 October 2023
Workgroup 6 Discuss consultation responses, refine solution and legal text	19 June 2023	Implementation Date	TBC
Workgroup 7 Finalise Workgroup Report and Legal text	05 July 2023		

Actions Review

5	WG2	BA/BM/ MG	Review definitions and compare with current available wording	WG3	Open
6	WG2	LJ	Share full document of risk definitions	WG3	Open
7	WG2	BA/FW	Share the academic paper relating to risk	WG3	Closed
8	WG2	BA/BM/ MG	Consider retrospective risk/unintended consequences for current windfarms	WG3	Open
9	WG2	MG	Provide detail on Bipole/ rigid bipole faults	WG3	Open
10	WG2	BA/CM	Review pricing details	WG3	Open
11	WG2	TP	Send invite for next Workgroup meeting	ASAP	Open

Carbon Trust methodology

José Antonio Reyna Gutiérre - Orsted

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SQSS Infeed Loss Risk Change Proposal

Bieshoy Awad/Fiona Williams– National Grid ESO Code Administrator

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Content

- Feedback from workgroup review
- Proposed text
- Revised HND costings re landing points
- FRCR costings
- Work in Progress

Recap of Modes of Failure:

Common Modes of Failure

- Electrical/Control
  - Mitigated by design
  - Guaranteed through definition of a single converter
- Mechanical (cable separation)
  - Risk mitigated by design
    - Adequate separation and depth throughout the route
      What are these parameters?
    - Other controls
      +
      A detailed risk assessment according to good industry practice showing an acceptable level of risk
      What is an acceptable level of risk?
  - Risk not mitigated by design but managed through restrictions

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Revised Definitions:

DC converter:

Any apparatus used as part of the national electricity transmission system to convert alternating current electricity to direct current electricity, or vice-versa. A DC Converter is a standalone operative configuration at a single site comprising one or more converter bridges, together with one or more converter transformers, converter control equipment, essential protective and switching devices and auxiliaries, if any, used for conversion. In a bipolar arrangement, where there is a common mode of failure that would cause a fault outage on either of the two poles to require the de-energisation of the other pole ~~affect the other pole~~ or where there are operational requirements that would mean that a planned outage on either of the two poles would require the other pole to be unavailable, a DC Converter represents the bipolar configuration. Otherwise, each of the two poles is a separate DC converter.

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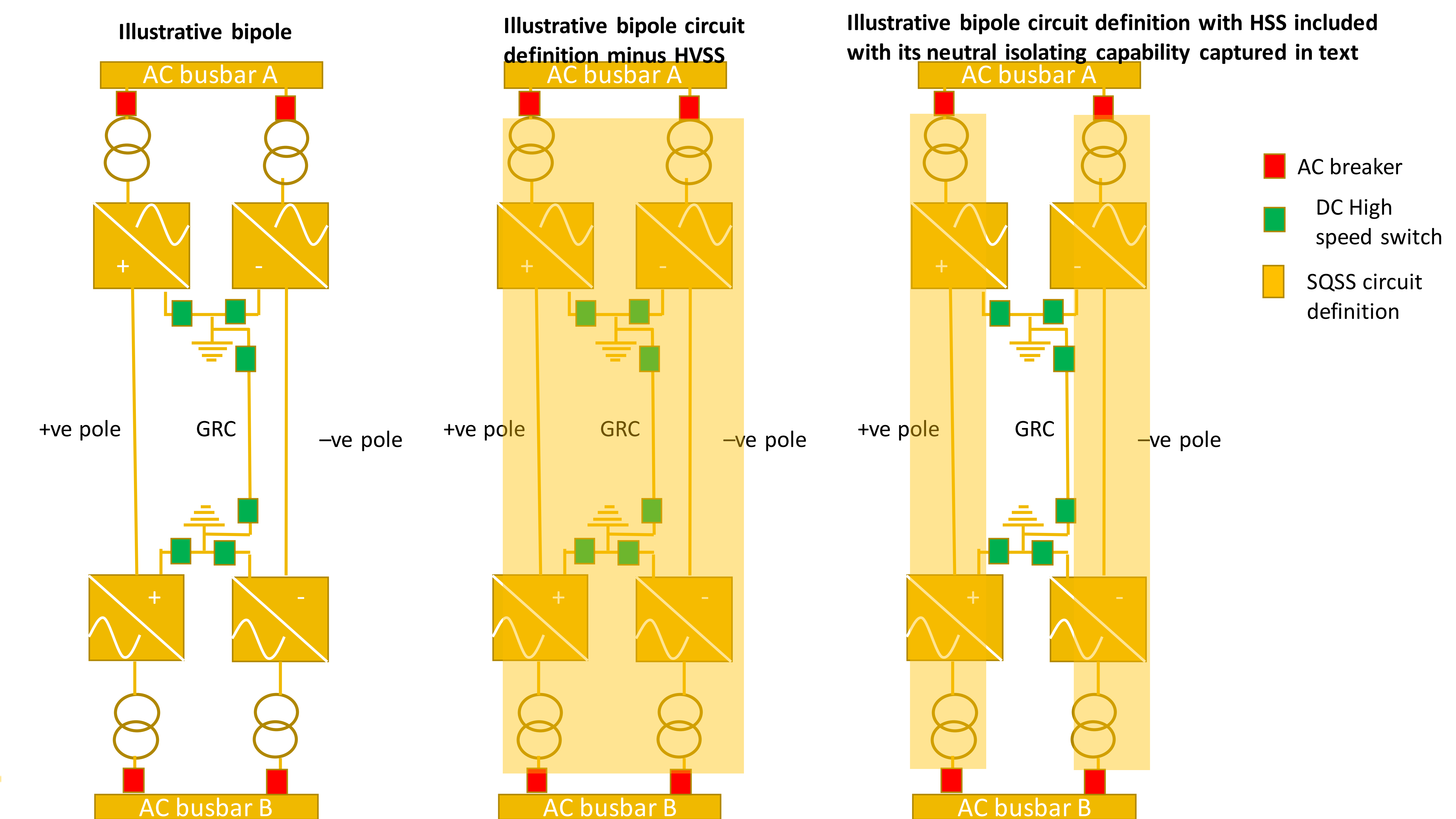

Illustrative bipole
AC busbar A
+
-
+ve pole
GRC
–ve pole
+
-
AC busbar B
Illustrative bipole circuit definition minus HVSS
AC busbar A
+
-
+ve pole
GRC
–ve pole
+
-
AC busbar B
Illustrative bipole circuit definition with HSS included with its neutral isolating capability captured in text
AC busbar A
+
-
+ve pole
GRC
–ve pole
+
-
AC busbar B
AC breaker
DC High speed switch
SQSS circuit definition

Revised Definitions:

Taking into account feedback provided by National HCDC Centre

DC High Speed Switch:

A high-speed switching device capable of operating within protection timescales to isolate the earth return of a bipolar DC link from either or both DC Converters of that link

Offshore Transmission Circuit:

Part of an offshore transmission system between two or more circuit-breakers and/or DC high Speed Switches which includes, for example, transformers, reactors, cables, overhead lines and DC converters but excludes busbars and onshore transmission circuits

Potentially, propose a similar revision for an Onshore Transmission Circuit provided that it doesn't have unintended consequences

Proposal for mitigation of anchor drag risk

Offshore Cable Circuits Sharing a High Risk Route:

Two or more cable offshore transmission circuits that run within a distance of 250 meters from each other for a distance of 1000 meters where the likelihood of mechanical failure of one or more of the circuits due to an external unplanned event is more prevalent is above one event in 2500 years.

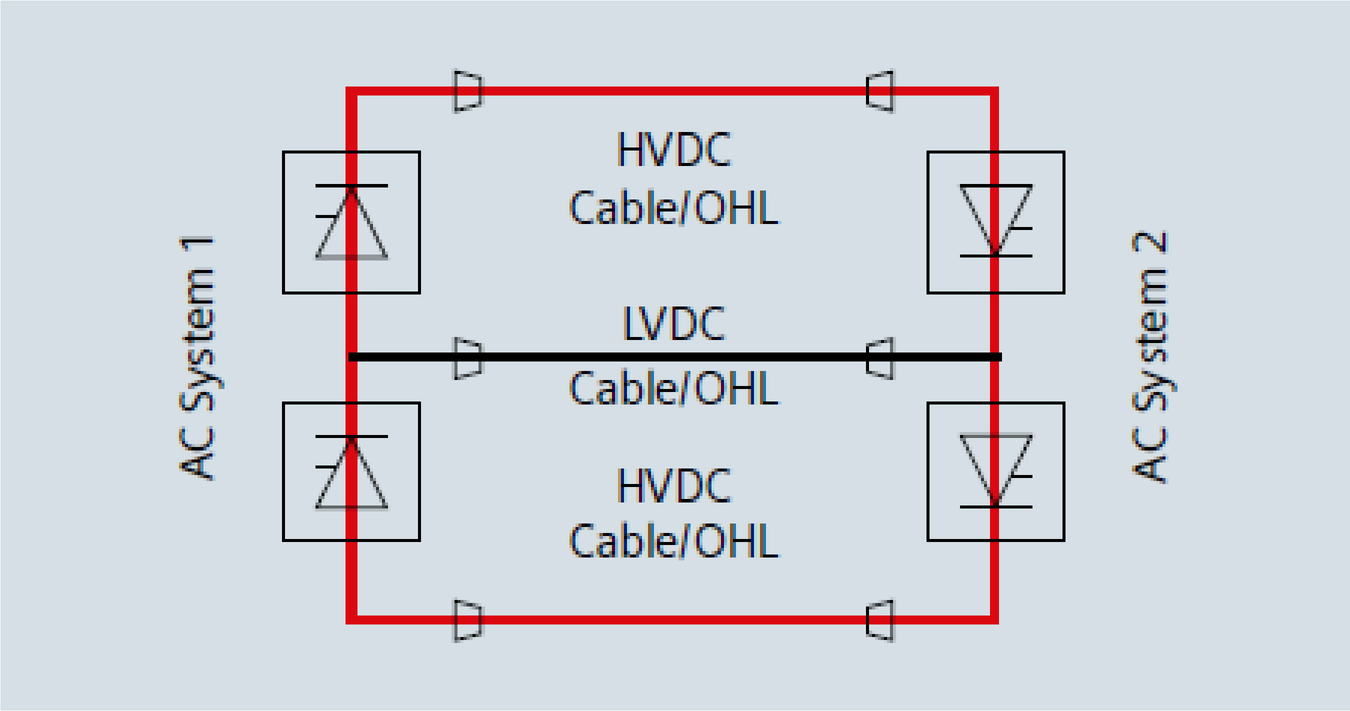
7.8.3 following the concurrent fault outage of any two cable offshore transmission circuits sharing a high risk route, the loss of power infeed shall not exceed the infrequent infeed loss risk;

Question, how to we define the length of the shared route to be considered an issue?

Question, if the 1 event per 2500 years is the likelihood of an anchor drag risk affecting one circuit, how would that translate into the risk of the event affecting two circuits?

Is the N-1-1criteria sufficiently robust to ensure faults on metallic returns are addressed – feedback required

7.8.2 following a *fault outage* of a single cable *offshore transmission circuit* during a *planned outage* of another cable *offshore transmission circuit* the further *loss of power infeed* shall not exceed the *infrequent infeed loss risk*.



Issue 2 – change to infeed loss risk

Why?

Assumption made during HND project, facilitates better use of offshore routes and landing points and better optimisation of offshore transmission assets

How?

- Change “normal” to “infrequent” in 7.7.2.1 and 7.7.12.1
- There is a need to calculate costings for reduced number of landing points versus increased frequency costs

HND Costings re landing points

Revised costings will be provided at the workgroup

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FRCR frequency response costings assumptions/method

1. We ran the FRCR analysis using a two 900MW link configuration assuming different levels of converter reliability (1, 2, 3, 5, and 10 events/converter/year) to estimate the impact on the number of frequency excursions above and below 49.5Hz. Assuming Hinkley C is in the background.
2. We repeated the analysis using one 1800MW link configuration. Assuming Hinkley C is in the background.
3. Increase the frequency response holding across the year to a level where the associated increase in the frequency response costs matches the same level of security for 49.5Hz events.

FRCR frequency response costings assumptions/method

- Hinkley C, a single 1800MW line, and two 900MW lines are added to the BMU lists
- Hinkley C's BMU history is derived from Sizewell, wind farm's BMU history is derived from Humber
- Most recent LoM data used
- FRCR don't have functions to calculate the additional cost of DC to secure 49.5Hz event. Hence, some simplified calculations are used.
- i.e. number of EFAs needs more DC * need 250MW more DC * £17/MWh DC costs * number of hours per EFA (Electricity Forward Agreement)
- DC cost of £17/MWh was the price when DC first launched, but costs have reduced after the market stabilised

FRCR frequency response costings

- **Number of HVDC trip** is the assumed HVDC trips per year for a single 1800MW line.
- **Number of 49.5 Hz event** is the expected number of 49.5Hz events based on the current frequency policies.
- **additional_cost (£m)** is the additional Dynamic Containment costs to achieve the same security level with two 900MW lines.

Number of HVDC trip	Number of 49.5 Hz event	Percentage of time additional response to be procured	additional_cost (£m)
0	1.59019151	0	0
1	1.931744021	0.179764479	6.698
2	2.273296532	0.235553456	8.772
3	2.614849043	0.262732701	9.792
5	3.297954065	0.289451281	10.778
10	5.00571662	0.313350928	11.679

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For ref: Fault statistics data (probability) for comparison with anchor drag risk:

Voltage	132kV	275kV	400kV	All	No. of years between 2 consecutive faults/km
SC trip	1.40%	0.50%	0.42%	0.63%	159.8664
DC trip	0.16%	0.04%	0.03%	0.06%	1561.205
Busbar/mesh corner trip	0.51%	0.72%	0.78%	0.69%	145.082
cable	0.00%	0.06%	0.25%	0.09%	1067.807

Voltage	132	275	400
single circuit	4216.967	6101.662	12094.64
Double circuit	2108.484	2563.373	4227.012
busbar/mesh cornor	455	609	706
cable	244.5135	479.4718	237.0412

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AOB & Next Steps

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WG4 -
Refine solution(s) and materials to be provided with Workgroup Consultation

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